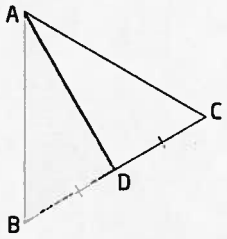
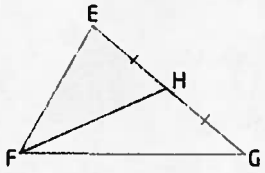
Practise

1. The area of $\triangle ABC$ is 12 square units. Find the area of $\triangle ABD$.



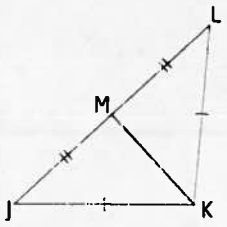
2. The area of $\triangle EFH$ is 30 square units. Find the area of $\triangle EFG$.



For help with questions 3 and 4, see the Example.

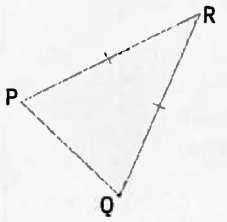
3. a) Which line segments are perpendicular in $\triangle JKL$?

b) Which angles are equal?



4. Which of the following coincide in $\triangle PQR$?

- the bisector of $\angle P$
- the bisector of $\angle R$
- the altitude from vertex Q
- the altitude from vertex R
- the right bisector of side PQ
- the median from vertex P



Connect and Apply

5. a) Draw any isosceles triangle. Then, construct the altitude from the vertex between the equal sides.

b) List three properties of this altitude that an altitude of a scalene triangle does not have.

c) Verify these properties by measuring your drawing.

6. Steve says, "If a median of a triangle is also an angle bisector, the triangle must be equilateral." Is he correct? Justify your answer.

7. a) Draw any right triangle. Find and label the midpoint of the hypotenuse.

b) Measure the distance from this midpoint to each of the vertices of the triangle. How are these distances related?

c) Investigate whether the same relationship applies for all right triangles. Describe your method and your findings.

8. List at least six properties of equilateral triangles. Explain how you know that every equilateral triangle has each of these properties.

9. Alana claims, "In an equilateral triangle, the angle bisectors and the right bisectors of the sides all meet at the same point." Do you agree with Alana's claim? Explain, using a diagram.

10. a) Draw any triangle and all three of its medians. The centroid divides each median into two sections. Compare the lengths of the sections of each median.

b) Investigate whether the centroid in every triangle divides each median in the same ratio. Outline your method and describe your findings.

c) Explain how you can use your findings in part b) to find the balance point of a flat triangular object.

11. Use T

a) Construct any $\triangle ABC$. Then, construct the midpoint D of side AB and the midpoint E of side AC.

b) Compare the slope and the length of line segment DE to those of side BC.

c) Investigate whether the relationships between DE and BC depend on the shape of the triangle. Describe your findings.

12. a) Draw a large triangle on a sheet of paper. Then, draw the angle bisector at each vertex. Are the three angle bisectors of your triangle concurrent?

b) Repeat part a) with different types of triangles. Does every triangle have an **incentre**, a point where all three angle bisectors meet? Explain your reasoning.

c) Put the point of a set of compasses at the incentre of a triangle, and adjust the compasses so that the pencil just touches one side of the triangle. Draw a circle with this radius. What property does the incentre of this triangle have?

d) What property does the incentre of every triangle have? Justify your answer.

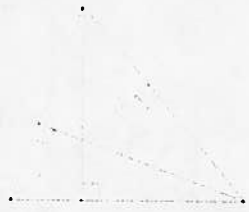
13. Use T Use geometry software to investigate the properties of the angle bisectors of a triangle. Outline your method and describe your findings.

14. a) Investigate whether every triangle has a **circumcentre**, a point where all the right bisectors of the sides meet. Describe your method and your results.

b) How are the distances from the circumcentre to the vertices related? Do all triangles have this property? Justify your answer.

c) A company with plants in Hamilton, Oshawa, and Barrie wants to set up a distribution centre that is roughly equidistant from the three plants. How can the company use the properties of triangles to find a suitable location?

15. In this triangle, the altitudes from the three vertices meet at a single point, called the **orthocentre**. Investigate whether the altitudes intersect at a single point in all triangles. Outline your method and describe your findings.



16. Use a triangle to estimate the geographical centre of Canada.

a) Trace the outline of Canada from a map onto a sheet of paper. Draw a triangle on your outline to approximate the shape of Canada as closely as you can.

b) Find the centroid of the triangle. Then, draw the angle bisectors of the triangle and find their point of intersection. Also find the point of intersection of the right bisectors of the sides and the point of intersection of the altitudes of the triangle. Which of these four points gives the best approximation for the geographic centre of Canada? Justify your choice.

c) Find the town or city closest to the centre you chose in part b). Compare your estimate with those made by your classmates.